



**UNITED STATES DEPARTMENT OF COMMERCE**  
**United States Patent and Trademark Office**

Address: COMMISSIONER OF PATENTS AND TRADEMARKS  
Washington, D.C. 20231

APPLICATION NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO.
--------------------	-------------	-----------------------	---------------------

EXAMINER
----------

ART UNIT	PAPER NUMBER
----------	--------------

DATE MAILED:

11/B JCV  
DEC. 2, 02

This is a communication from the examiner in charge of this application.  
COMMISSIONER OF PATENTS AND TRADEMARKS

**NOTICE OF ALLOWABILITY**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance and Issue Fee Due or other appropriate communication will be mailed in due course. THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS. This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

☒ This communication is responsive to THE AMENDMENT DATE-STAMPED NOV. 4, 2002 AND INTERVIEW OF DEC. 2, 2002  
☒ The allowed claim(s) is/are 26-33

☒ The drawings filed on NOV. 24, 2000 are acceptable as formal drawings.

☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

☒ All ☐ Some\* ☐ None of the:

☒ Certified copies of the priority documents have been received.

☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.

☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\*Certified copies not received: \_\_\_\_\_

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with requirements noted below. Failure to timely comply will result in ABANDONMENT of this application. **THIS THREE-MONTH PERIOD IS NOT EXTENDABLE FOR SUBMITTING NEW FORMAL DRAWINGS, OR A SUBSTITUTE OATH OR DECLARATION.** ~~This three-month period for complying with the REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL is extendable under 37 CFR 1.106(e).~~

☐ Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL APPLICATION, PTO-152, which discloses that the oath or declaration is deficient. A SUBSTITUTE OATH OR DECLARATION IS REQUIRED.

☐ Applicant MUST submit NEW FORMAL DRAWINGS

☐ because the originally filed drawings were declared by applicant to be informal.

☐ including changes required by the Notice of Draftperson's Patent Drawing Review, PTO-948, attached hereto or to Paper No. \_\_\_\_\_.

☐ including changes required by the proposed drawing correction filed on \_\_\_\_\_, which has been approved by the examiner.

☐ including changes required by the attached Examiner's Amendment/Comment or in the Office action of Paper No. \_\_\_\_\_.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings.

☐ Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Any reply to this notice should include, in the upper right hand corner, the APPLICATION NUMBER (SERIES CODE/SERIAL NUMBER). If applicant has received a Notice of Allowance and Issue Fee Due, the ISSUE BATCH NUMBER and DATE of the NOTICE OF ALLOWANCE should also be included.

**Attachment(s)**

☒ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). \_\_\_\_\_

☐ Notice of Draftperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

☒ Interview Summary, PTO-413

☒ Examiner's Amendment/Comment

☐ Examiner's Comment Regarding Requirement for the Deposit of Biological Material

☒ Examiner's Statement of Reasons for Allowance

Timothy J. Silverman  
Supervisory Patent Examiner  
Technology Center 1700

Application/Control Number: 09/718,483

Art Unit: 1754

# 10/B Jev  
dec. 2, 02  
Page 2

### ***Examiner's Amendment***

An Examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to the Applicants, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this Examiner's amendment was given in a telephone interview with Mr. Surinder Sachar, Applicants' Attorney, on Dec. 2, 2002.

The application has been amended as follows:

The abstract has been canceled and replaced with the following new abstract:

---

#### **ABSTRACT**

B1 In processes for coating objects, such as semiconductor wafers, with a film of metal, such as titanium metal, a metal-containing compound, such as  $\text{TiCl}_4$ , is injected into a chamber containing the object and a portion of the metal-containing compound reacts to provide the film of metal on the object and a gas containing by-products, such as unreacted  $\text{TiCl}_4$  and  $\text{TiCl}_x$  ( $x < 4$ ), which is discharged out of the chamber and passed through a trap mechanism and an eliminator for the removal of the by-products out of the gas. The by-products have relatively high vapor pressures, making them difficult to trap. The Applicants have found that by adding a reagent, such as water,  $\text{O}_2$  or  $\text{NH}_3$ , into the exhaust gas at a location upstream of the trap mechanism and eliminator, the reagent reacts with the by-product in the gas to produce a compound, such as  $\text{TiCl}_4 \cdot 2\text{NH}_3$ , which has a significantly lower vapor pressure than the by-product and can be removed in the trap mechanism.

---

44

6

Art Unit: 1754

Claims 1-11 and 13-25 have been canceled and new claims 26-33 have been added:

26. A method for removing impurities out of an exhaust gas discharged from a chamber used for depositing metallic films on objects, comprising:

discharging the exhaust gas containing impurities generated from a process selected from the group consisting of: (i) a process for depositing TiN on an object by using  $\text{TiCl}_4$ ,  $\text{H}_2$  and  $\text{NH}_3$ , (ii) a process for depositing WN on an object by using  $\text{WF}_6$  and  $\text{NH}_3$ , (iii) a process for depositing W on an object by using  $\text{WF}_6$  and  $\text{SiH}_4$ , (iv) a process for depositing WSi film on an object by using  $\text{WF}_6$  and  $\text{SiH}_2\text{Cl}_2$  and (v) a process for depositing  $\text{Ta}_2\text{O}_5$  on an object by using pentoethoxy tantalum and  $\text{O}_2$ ;

injecting a reactant gas selected from the group consisting of an oxygen-containing gas, water and ammonia into the exhaust gas, wherein the reactant gas reacts with the impurities to form reaction by products which have a lower vapor pressure than the vapor pressure of the impurities, and

passing the reaction by product-containing gas through a condenser, wherein the reaction by-products are condensed out of the exhaust gas.

27. The method of claim 26, further comprising the step of passing the gas from the condenser and through an eliminator.

28. The method of claim 26, wherein the impurity is  $\text{TiCl}_4$ , the reactant gas is ammonia and the reaction by product is  $\text{TiCl}_4 \cdot \text{NH}_3$ .

29. The method of claim 26, wherein the reactant gas is mixed with an inert gas.

Art Unit: 1754

30. The method of claim 26, wherein the object is selected from the group consisting of a glass substrate, a LCD substrate and a semiconductor wafer.

31. A method for removing impurities out of an exhaust gas discharged from a chamber used for depositing metallic films on objects, comprising:

discharging the exhaust gas containing impurities comprising  $\text{TiCl}_4(\text{NH}_3)_n$  and/or  $\text{TiF}_4(\text{NH}_3)_n$  out of the chamber;

passing the impurity-containing gas through a condenser, which traps the  $\text{TiCl}_4(\text{NH}_3)_n$  and/or  $\text{TiF}_4(\text{NH}_3)_n$  inside the condenser;

injecting an oxygen-containing gas into the exhaust gas at a location upstream of the condenser or into the condenser, wherein the oxygen reacts with the impurities inside the condenser to form reaction by products selected from the group consisting of  $\text{TiO}_2$ ,  $\text{HCl}$ ,  $\text{HF}$  and  $\text{NH}_3$ , while evacuating the chamber by withdrawing gas from the chamber through a by-pass line which passes the gas from an outlet of the chamber and into the exhaust gas line at a location downstream of the condenser and upstream of the pump that evacuates the chamber, and

passing the gas generated within the condenser through a downstream eliminator, which removes the  $\text{NH}_3$  and at least one selected from the group consisting of  $\text{HF}$  and  $\text{HCl}$  out of the gas.

32. The method according to claim 31, wherein the condenser contains  $\text{TiO}_2$ , and the  $\text{TiO}_2$ -containing condenser is detached from the exhaust gas line and cleaned.

33. The method according to claim 31, wherein a reactant gas is injected into the exhaust gas at a location upstream of the condenser.

B2  
(cont'd.)

48

5

***Statement of Reasons for Allowance***

The following is an Examiner's statement of reasons for allowance: U. S. Pat. 5,788,747 is directed to the deposition of aluminum on a semiconductor wafer by using dimethylaluminum hydride (i. e. DMHA) (please see col. 2 ln. 66 to col. 3 ln. 6 in U. S. Pat. 5,788,747, for example), which is not among the processes listed in the 1<sup>st</sup> full paragraph in claim 26. Further, U. S. Pat. 5,788,747 does not teach or suggest a method for treating an exhaust gas containing  $\text{TiCl}_4(\text{NH}_3)_n$  and  $\text{TiF}_4(\text{NH}_3)_n$ , as set forth in claim 31.

Any comments considered necessary by the Applicants must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Timothy C. Vanoy whose telephone number is 703-308-2540. The examiner can normally be reached on 8 hr. days.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman, can be reached on 703-308-3837. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

6

Application/Control Number: 09/718,483

Page 6

Art Unit: 1754

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.



Timothy Vanoy/tv  
December 2, 2002

